

**Draft California Science Framework for K-12 Public Schools**  
**January 25, 2002**

**Chapter 5 – Universal Access**

Science education is for all students. The design of academic instruction must be one that assures each student of the opportunity to master the science content standards which provide systematic and coherent access to this challenging subject. Students with disabilities need to be accommodated in their quest to master the standards, including those in the investigation and experimentation strand. Advanced learners need to be given meaningful assignments that extend the depth and breadth of their understanding of the standards.

**Science and Basic Skills Development**

The acquisition of scientific knowledge and ideas requires foundational and fundamental skills from the areas of English-language arts and mathematics. Students pursuing the science content reflected in the standards and described in this framework need to master the grade-level standards in English-language arts and mathematics. Teachers and students will find that science and English-language arts share the goals of reading and comprehending informational text and writing grammatically correct expository essays. Because these skills are integral to teaching science, teachers need to reinforce their application in the learning of science. In short, teachers must be sure that students develop the necessary academic language and skills, including the correct use of scientific terminology, written expression, mathematics, and scientific knowledge.

**Academic Language Development**

Studying science means acquiring a new vocabulary and learning that some familiar words may have different meanings in science. This aspect of scientific literacy needs to be taught explicitly in order to minimize misconceptions that might otherwise arise from word usage in differing environments. For example the terms *control* and *theory* have different definitions in common use versus scientific use. Also, students will begin to acquire new terms with Latin and Greek roots, prefixes, and suffixes. An understanding of root words and affixes will not only improve vocabulary but will also increase students' comprehension of new words. For example, students will come to know that biology is a combination of "bio-," derived from the Greek word for life, and "-logy" (as also rooted in Greek) meaning study.

**English Learners**

Support for English learners includes the pre-teaching of essential elements of scientific vocabulary. Instruction in the oral and written academic language of science for English learners is a critical element that must be specifically designed, planned, and taught. It includes direct instruction and experiences for students in English phonology, morphology, syntax, and semantics, and it must support students as they move toward proficiency in the academic language of science. The investigation and experimentation standards provide an additional opportunity for teachers to reinforce English learners' understanding of the academic language of science.

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The *Reading/Language Arts Framework* describes three groups of English learners:

- Students in kindergarten through grade two;
- Students in grade three through twelve who are literate in their primary language; and
- Students in grades three through twelve who have limited prior academic experience or literacy in their primary language.

In the teaching of science, teachers clearly find the biggest challenge is addressing the needs of English learners in the latter two groups. Students in grades three through twelve who have strong literacy skills in their primary language can be expected to transfer many of those skills to English and to progress rapidly in learning the academic language of science. Students in grades three through twelve with limited prior schooling will require intensive support in learning the academic language of science.

### **Advanced Learners**

Ensuring mastery of the science content standards through challenging and enriching instruction is the goal for advanced learners. Students who readily understand the basic underpinnings of the standards may pursue this content in a richer manner. Advanced learners in kindergarten through grade eight must be encouraged to extend their knowledge of science through the enrichment opportunities included in state-adopted instructional materials. Enrichment lessons have high levels of standards-based science content proportionate to the amount of time that the lessons take. These students are encouraged to explore, for example, the history of a scientific concept or how to apply a complex method of experimentation. Enrichment projects need to be designed so that the student does the bulk of the work in the classroom.

### **Students with Disabilities**

Students with disabilities are provided access to all the content standards through a rich and supported program that uses instructional materials and strategies that best meet their needs. A student's 504 Accommodation Plan or Individual Educational Plan (IEP) often includes a variety of techniques to ensure that the student has full access to a program designed to provide them mastery of the science content standards, including those in the investigation and experimentation strand. Teachers must familiarize themselves with each student's 504 Accommodation Plan or IEP in order to assist the student in achieving mastery of the science content standards.

There are numerous accommodations a teacher can implement in science teaching. Disabilities vary widely and accommodations must be tailored to the student's individual and unique needs. Some accommodations help ensure safety while participating in investigation and experimentation activities. Examples of some simple safety accommodations include: textured tape to help visually-impaired students locate buttons and knobs, insulation of exposed pipes that may burn a student who lacks lower extremity sensation and would likely be in a wheelchair, benches at an appropriate height

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1 for wheelchair access, and emergency showers and eyewashes accessible to wheelchairs.  
2 Labels may be printed in larger fonts for low-vision students. Instructions and safety  
3 notices are not to be red-green color coded, and chemical indicators must not be of the  
4 type that change from red to green, because of the incidence of red-green colorblindness  
5 in some male students. Laboratory instructions and protocols need to be written and  
6 detailed for students who are hearing impaired or who have auditory processing  
7 disorders. Printed instructions detailing each step of a laboratory exercise, checklists to  
8 indicate whether each step has been accomplished, and color coding information, aid all  
9 children but particularly those with sequencing disabilities or Attention Deficit Disorder.

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11 Resources for understanding and addressing the needs of students with disabilities

12  
13 California Special Education Programs: A Composite of Laws Database  
14 Education Code, Part 30, Other Related Laws and California Code of Regulations, Title 5  
15 at <http://www.cde.ca.gov/spbranch/sed/lawsreg2.htm>.

16  
17 *A Composite of Laws, 2002, 24th Edition.* (CDE Press at (800) 995-4099 and in  
18 January 2002 at <http://www.cde.ca.gov/spbranch/sed/compodr.htm>.  
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